

Conference Abstract

# History and Importance of the Fern Herbarium Collections in Japan, With Focus on the University of Tokyo Herbarium

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## Abstract

### HERBARIUM PLANT SPECIMENS AND THEIR HERBARIUM HOLDINGS

Natural history collections around the globe represent a dormant source of taxonomic and biogeographic information, as it is estimated that one to three billion specimens are included in such collections (Soberon 1999; Ariño 2010). In the case of botanical collections, the worldwide distribution of specimens across herbaria is often uneven and biased by colonialism, with most specimens housed in the global North, and in many cases resulting in a reverse latitudinal relationship between plant diversity present in nature and the location of the herbaria housing it (Park et al. 2023). As an example, Yong (2013) reviewed holdings of common and type specimens and concluded that the type specimens' accumulation in China is less than the world average. The number of type specimens is an important reflection of botanical accumulation in a country, and the number of specimens and their origins are therefore very important in a globalized framework. Accordingly, efforts to catalogue and digitize collections, and to make them globally accessible, are important tasks for herbaria.

## HERBARIA IN JAPAN AND THE UNIVERSITY OF TOKYO (TI) HERBARIUM

In Japan, 74 herbaria are registered in Index Herbariorum (Thiers 2024), accounting for more than 13 million plant specimens. Herbaria in Japan date from the 19th century, with the first herbarium founded in Japan being the University of Tokyo's (TI) herbarium (Herbarium of the University of Tokyo 2021) established in 1877. The herbarium holds a collection of more than 1,800,000 specimens of vascular plants, corresponding to ca. 14% of the total botanical collection of Japan. Although there is no complete survey of the number of specimens in the collection, it is estimated that the TI herbarium holds 20,000 type specimens, corresponding to 1% of the total number in the collection. Within the type specimens, only a fraction of the collection is digitized and available online, including 3,793 type specimens of angiosperms (and 1,743+ type specimens from other groups newly photographed in the last year). Regarding the ferns and lycophytes, the TI herbarium holds 35 families, including more than 300,000 specimens, comprising 1068+ type specimens (with 321 confirmed holotypes, 127 isotypes, and 510 syntypes), which are now being databased.

The TI herbarium fern and lycophyte type collection includes plants from Japan, and important collections from Korea, Manchuria, Taiwan, and many Southeast Asian countries. Collections from outside Japan were mainly gathered by Japanese botanists that were assigned to expeditions in those countries, as Japan's national power increased rapidly after the Meiji restoration (1869–1889). For example, Takiya Kawakami, originally from the Hokkaido University, actively worked on collecting plants from Taiwan; Hiroshi Hara worked on the Himalayan flora; Takenoshin Nakai worked on the Korean flora and collected medicinal plants from Indonesia and Ceylon (Sri Lanka); and Bunzo Hayata made a huge contribution to Taiwan's flora. The specimens collected hold not only information on the taxonomic diversity, but also reflect historic events between Japan and these adjacent countries, thus proper curation of these materials is of great importance. The TI herbarium also holds unique collections, including many fern specimens collected from Seram Island (Indonesia), South America's Andes collections by Fumio Maekawa, and Brazil's Amazon collections by Masayuki Takeuchi.

## THE HIDDEN POTENTIAL OF THE TI HERBARIUM AND FUTURE PROSPECTS

The TI herbarium collection is an important resource of natural history information, but its potential is still hindered by its incomplete databasing. In the Global Biodiversity Information Facility (GBIF) database, the Tracheophyta data from Japan currently consists of 3,503,623 herbarium specimens (GBIF.org 2024). Most of the data is from the TNS herbarium (500,060 specimens, National Museum of Nature and Science 2024), Kanagawa Prefectural Museum of Natural History (318,574 specimens, Kanagawa Prefectural Museum of Natural History 2024) and Nagano Environmental Conservation Research Institute (170,889 specimens, Nagano Prefecture 2023). The University of Tokyo's TI herbarium data only contains 40,382 specimens, not including any ferns or lycophytes, restricting access to the collection for researchers abroad. The TI herbarium mission now is to properly catalogue and make that information available, especially to those based in regions from where the plants were originally collected. Since 1981, many

scientists have contributed to the cataloguing of the type specimens in the TI herbarium, with some of this data made available [online](#). However, it is estimated that this database covers less than 10% of the collection, and does yet not include the ferns or lycophytes. We see the development of an open-access database for the TI herbarium as of utmost importance, as the herbarium represents an important historical and biodiversity account for East Asia.

## Keywords

data access, historical collection, plant specimens, South-East Asia, specimen holdings, type specimens

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## Conflicts of interest

The authors have declared that no competing interests exist.

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